



12781 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Cycle: 5, Proposal Category: DD

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JWST Proposal 12781 (Created: Monday, July 27, 2026, 6:00:20PM Eastern Standard Time) - Overview

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OBSERVATIONS

Folder	Observation	Label	Observing Template	Science Target
NIRCam				
	6	E1	NIRCam Imaging	(1) Athena-2
	7	E2	NIRCam Imaging	(1) Athena-2
	8	E3	NIRCam Imaging	(1) Athena-2
NIRSpec Follow-up				
	14	NIRSpec	NIRSpec Fixed Slit Spectroscopy	(1) Athena-2

ABSTRACT

When a supernova (SN) occurs in a strongly lensed galaxy, the foreground gravitational potential produces measurable time delays between its multiple images. Comparing these delays with strong-lensing model predictions provides a direct, one-step measurement of H_0 . The strongly lensed SN Athena was discovered in October 2025 with JWST/NIRCam by comparing new observations with archival 2022 imaging of the $z=0.87$ “question mark” galaxy, which is quintuply imaged by the foreground cluster MACS J0417. Light-curve fitting of follow-up imaging, combined with three newly constructed lens models, conservatively predicts that Athena will reappear between mid-August 2026 and early March 2027 in a counterimage only a few arcseconds away, offering an exceptionally rare opportunity to capture the reappearance of a lensed SN. We propose a joint JWST+HST program to perform imaging throughout this window to detect the SN and map its light curve, followed by NIRSpec/PRISM spectroscopy in the final visit to confirm its type. A 20-day imaging cadence will enable early detection and, together with the >1 -year delay baseline, constrain the relative time delay to 1-5%. Combined with existing lens models, we forecast that Athena will measure H_0 to $<8\%$, among the most precise constraints from any lensed SN to date. Athena will also provide a powerful blind probe of lens-model systematics by testing the model-

predicted position of its reappearance - a test previously achieved only with SN Refsdal. This program will therefore give Athena an outsized legacy, delivering both a competitive measurement of H_0 and a stringent test of lens-model accuracy.

OBSERVING DESCRIPTION

This is the JWST component to an joint JWST+HST proposal to monitor for, detect, and map the light curve of the reappearance of the strongly lensed supernova (SN) Athena at $z=0.871$. The proposal includes 3 JWST monitoring epochs with three filter pairs F090W/F300M, F115W/F277W, and F150W/F356W with a ~ 20 day cadence during which there is a large gap in HST visibility where the supernova can be missed. We accompany the final epoch with NIRSspec PRISM fixed slit to confirm the SN type.

Proposal 12781 - Targets - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Fixed Targets	#	Name	Target Coordinates	Targ. Coord. Corrections	Miscellaneous
	(1)	Athena-2	RA: 04 17 34.6500 (64.3943750d) Dec: -11 54 27.27 (-11.90758d) Equinox: J2000		
	Comments: Category=Star Description=[Supernovae]				
	(2)	NIRSPec-TA	RA: 04 17 34.4472 (64.3935300d) Dec: -11 54 22.82 (-11.90634d) Equinox: J2000		
	Comments: Category=Star Description=[O stars]				

Proposal 12781 - Observation 6 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Observation	Proposal 12781, Observation 6: E1									Mon Jul 27 23:00:20 GMT 2026
	Diagnostic Status: Warning									
Observing Template: NIRCcam Imaging										
Diagnostics	(E1 (Obs 6)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.									
	(Visit 6:1) Warning (Form): Data Excess over lower threshold									
(Visit 6:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous	
	(1)	Athena-2	RA: 04 17 34.6500 (64.3943750d) Dec: -11 54 27.27 (-11.90758d) Equinox: J2000							
Comments: Category=Star Description=[Supernovae]										
Template	Module		Subarray				Target Placement			
	ALL		FULL				Module gap (large extended source)			
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions
	1	INTRAMODULEBOX		4		STANDARD				1
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID
	1	F090W	F300M	BRIGHT1	8	2	8	4	1331.359	
	2	F115W	F277W	BRIGHT1	8	2	8	4	1331.359	
	3	F150W	F356W	BRIGHT2	6	2	8	4	1073.677	
Special Requirements	Between Dates 14-JAN-2027:00:00:00 and 18-JAN-2027:00:00:00 Offset -90.0 arcsec, 0.0 arcsec									
	7 After 6 by 18 Days to 22 Days									

Proposal 12781 - Observation 7 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Observation	Proposal 12781, Observation 7: E2										Mon Jul 27 23:00:20 GMT 2026
	Diagnostic Status: Warning										
	Observing Template: NIRCam Imaging										
Diagnostics	(E2 (Obs 7)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.										
	(Visit 7:1) Warning (Form): Data Excess over lower threshold										
	(Visit 7:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous		
	(1)	Athena-2	RA: 04 17 34.6500 (64.3943750d) Dec: -11 54 27.27 (-11.90758d) Equinox: J2000								
	Comments: Category=Star Description=[Supernovae]										
Template	Module		Subarray				Target Placement				
	ALL		FULL				Module gap (large extended source)				
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F090W	F300M	BRIGHT1	8	2	8	4	1331.359		
	2	F115W	F277W	BRIGHT1	8	2	8	4	1331.359		
	3	F150W	F356W	BRIGHT2	6	2	8	4	1073.677		
Special Requirements	Offset -90.0 arcsec, 0.0 arcsec										
	7 After 6 by 18 Days to 22 Days										
	8 After 7 by 18 Days to 22 Days										

Proposal 12781 - Observation 8 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Observation	Proposal 12781, Observation 8: E3										Mon Jul 27 23:00:20 GMT 2026
	Diagnostic Status: Warning										
	Observing Template: NIRCam Imaging										
Diagnostics	(E3 (Obs 8)) Warning (Form): By selecting Target Placement = Module Gap the target coordinates will not fall on any detector unless an appropriate Mosaic, set of Dithers or Offset Special Requirement is specified.										
	(Visit 8:1) Warning (Form): Data Excess over lower threshold										
	(Visit 8:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.										
Fixed Targets	#	Name	Target Coordinates				Targ. Coord. Corrections			Miscellaneous	
	(1)	Athena-2	RA: 04 17 34.6500 (64.3943750d)								
			Dec: -11 54 27.27 (-11.90758d)								
	Equinox: J2000										
	Comments: Category=Star Description=[Supernovae]										
Template	Module		Subarray					Target Placement			
	ALL		FULL					Module gap (large extended source)			
Dithers	#	Primary Dither Type		Primary Dithers		Subpixel Dither Type		Dither Size		Subpixel Positions	
	1	INTRAMODULEBOX		4		STANDARD				1	
Spectral Elements	#	Short Filter	Long Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Dithers	Total Exposure Time	Optional ETC ID	
	1	F090W	F300M	BRIGHT1	8	2	8	4	1331.359		
	2	F115W	F277W	BRIGHT1	8	2	8	4	1331.359		
	3	F150W	F356W	BRIGHT2	6	2	8	4	1073.677		
Special Requirements	Offset -90.0 arcsec, 0.0 arcsec										
	8 After 7 by 18 Days to 22 Days Group Observations 8, 14, Non-interruptible										

Proposal 12781 - Observation 14 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Observation	Proposal 12781, Observation 14: NIRSpec										Mon Jul 27 23:00:20 GMT 2026	
	Diagnostic Status: Warning											
	Observing Template: NIRSpec Fixed Slit Spectroscopy											
Diagnostics	(NIRSpec (Obs 14)) Warning (Form): Observers are responsible for checking that target acquisition is feasible.											
	(Visit 14:1) Warning (Form): Overheads are provisional until the Visit Planner has been run.											
Fixed Targets	#	Name	Target Coordinates			Targ. Coord. Corrections			Miscellaneous			
	(1)	Athena-2	RA: 04 17 34.6500 (64.3943750d) Dec: -11 54 27.27 (-11.90758d) Equinox: J2000									
	Comments: Category=Star Description=[Supernovae]											
Acquisition	#	Target	TA Method	Subarray	Filter	Readout Pattern	Groups/Int	Integrations/Exp	Total Integrations	Total Exposure Time	Optional ETC ID	
	1	2 NIRSPec-TA	WATA	FULL	F110W	NRSRAPIDD6	3	1	1	171.788		
Template	HFF Readout Mode				Slit				Subarray			
	false				S200A1				FULL			
Dithers	#	Primary Dither Positions						Sub-Pixel Pattern				
	1	5						NONE				
Spectral Elements	#	Grating/Filter	Slit	Readout Pattern	Groups/Int	Integrations/Exp	#	Autocal	Total Dithers	Total Integrations	Total Exposure Time	Optional ETC ID
	1	PRISM/CLEAR	S200A1	NRSIRS2	11	1	1	NONE	5	5	4084.889	

Proposal 12781 - Observation 14 - Catching the reappearance of strongly lensed supernova with a 1+ year time-delay

Special Requirements	Group Observations 8, 14, Non-interruptible
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